

General Description

The GreenMOS[®] high voltage MOSFET utilizes charge balance technology to achieve outstanding low on-resistance and lower gate charge. It is engineered to minimize conduction loss, provide superior switching performance and robust avalanche capability.

The GreenMOS[®] Z series is integrated with fast recovery diode (FRD) to minimize reverse recovery time. It is suitable for resonant switching topologies to reach higher efficiency, higher reliability and smaller form factor.

Features

- Low $R_{DS(ON)}$ & FOM
- Extremely low switching loss
- Excellent stability and uniformity
- Ultra-fast and robust body diode




Applications

- PC power
- Telecom power
- Server power
- EV Charger
- Motor driver

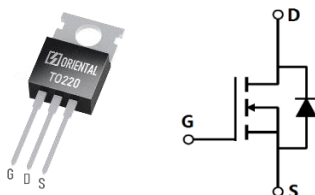
Key Performance Parameters

Parameter	Value	Unit
V_{DS}	600	V
$I_{D, pulse}$	156	A
$R_{DS(ON), max} @ V_{GS}=10V$	45	m Ω
Q_g	68	nC
PD	330	W

Marking Information

Product Name	Package	Marking
OSG60R045PT4EZF	TO220	OSG60R045PT4EZ

Package & Pin Information



Absolute Maximum Ratings at $T_j=25^{\circ}\text{C}$ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	600	V
Gate-source voltage (static)	V_{GS}	± 20	V
Gate-source voltage (dynamic)		± 30	V
Continuous drain current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_D	52	A
Continuous drain current ¹⁾ , $T_C=100^{\circ}\text{C}$		33	
Pulsed drain current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{D, pulse}$	156	A
Continuous diode forward current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_S	52	A
Diode pulsed current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{S, pulse}$	156	A
Power dissipation ³⁾ , $T_C=25^{\circ}\text{C}$	P_D	330	W
Single pulsed avalanche energy ⁴⁾	E_{AS}	405	mJ
MOSFET dv/dt ruggedness, $V_{DS}=0\dots 400\text{ V}$	dv/dt	100	V/ns
Reverse diode dv/dt, $V_{DS}=0\dots 400\text{ V}$, $I_{SD}\leq I_D$	dv/dt	50	V/ns
Operation and storage temperature	T_{stg}, T_j	-55 to 150	$^{\circ}\text{C}$

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	$R_{\theta JC}$	0.38	$^{\circ}\text{C/W}$
Thermal resistance, junction-ambient	$R_{\theta JA}$	62	$^{\circ}\text{C/W}$

Electrical Characteristics at $T_j=25^{\circ}\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	600			V	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	3.5		5.5	V	$V_{DS}=V_{GS}$, $I_D=1\text{ mA}$
Drain-source on-state resistance	$R_{DS(ON)}$		40	45	m Ω	$V_{GS}=10\text{ V}$, $I_D=26\text{ A}$
			100			$V_{GS}=10\text{ V}$, $I_D=26\text{ A}$, $T_j=150^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}			100	nA	$V_{GS}=20\text{ V}$
				-100		$V_{GS}=-20\text{ V}$
Drain-source leakage current	I_{DSS}			10	μA	$V_{DS}=600\text{ V}$, $V_{GS}=0\text{ V}$
Gate resistance	R_G		3.9		Ω	$f=1\text{ MHz}$, Open drain

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		4040		pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=100\text{ kHz}$
Output capacitance	C_{oss}		258		pF	
Reverse transfer capacitance	C_{rss}		2.7		pF	
Effective output capacitance, energy related	$C_{o(er)}$		166		pF	$V_{GS}=0\text{ V}$, $V_{DS}=0\text{ V}-400\text{ V}$
Effective output capacitance, time related	$C_{o(tr)}$		967		pF	
Turn-on delay time	$t_{d(on)}$		28.5		ns	$V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $R_G=2\ \Omega$, $I_D=26\text{ A}$
Rise time	t_r		53		ns	
Turn-off delay time	$t_{d(off)}$		56		ns	
Fall time	t_f		2.3		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		68		nC	$V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $I_D=26\text{ A}$
Gate-source charge	Q_{gs}		26		nC	
Gate-drain charge	Q_{gd}		23		nC	
Gate plateau voltage	$V_{plateau}$		7		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V_{SD}			1.3	V	$I_S=52\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		160		ns	$V_R=400\text{ V}$, $I_S=26\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		0.94		μC	
Peak reverse recovery current	I_{rrm}		10.3		A	

Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3) P_d is based on max. junction temperature, using junction-case thermal resistance.
- 4) $V_{DD}=100\text{ V}$, $V_{GS}=10\text{ V}$, $L=80\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

Electrical Characteristics Diagrams

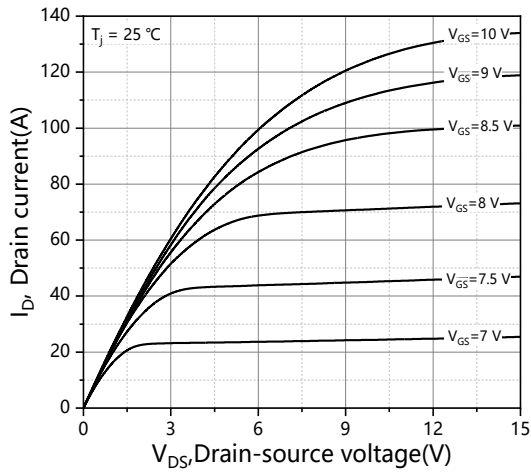


Figure 1. Typ. output characteristics $T_J=25^\circ\text{C}$

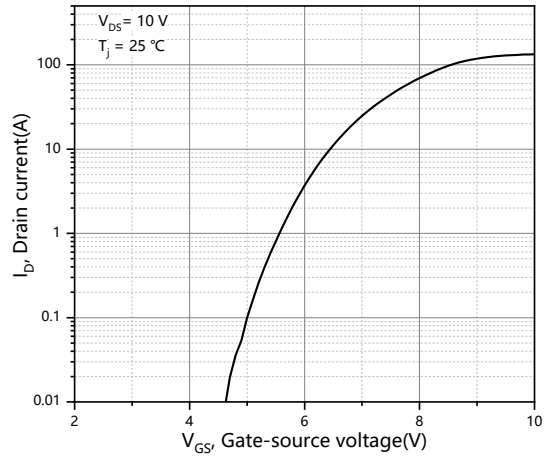


Figure 2. Typ. transfer characteristics

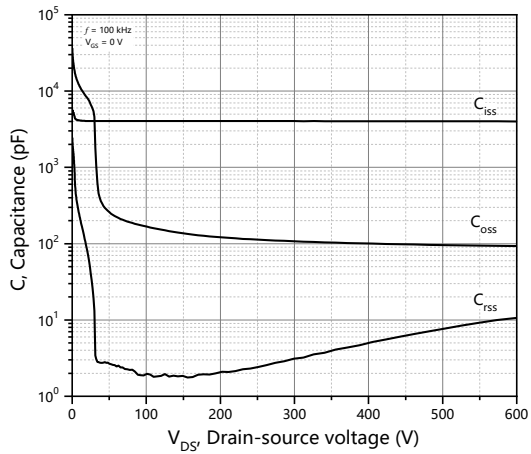


Figure 3. Typ. capacitances

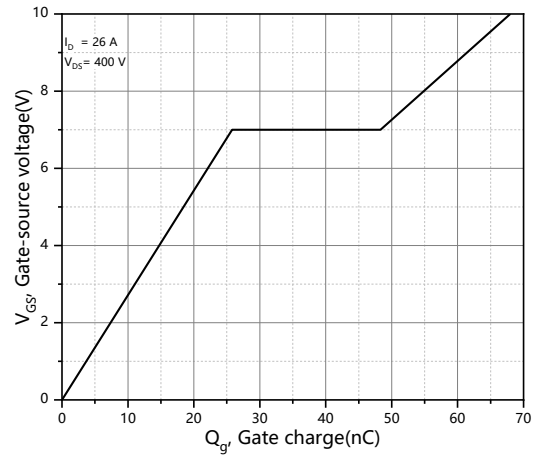


Figure 4. Typ. gate charge

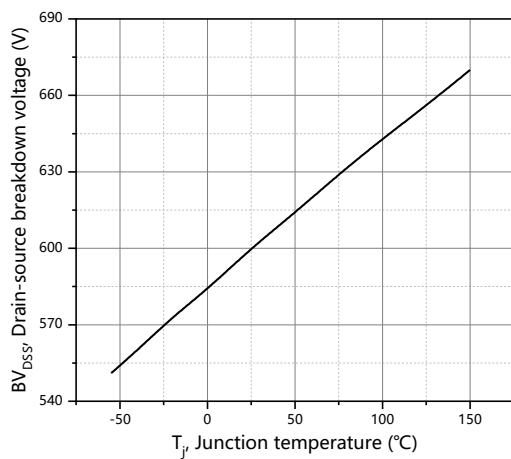


Figure 5. Drain-source breakdown voltage

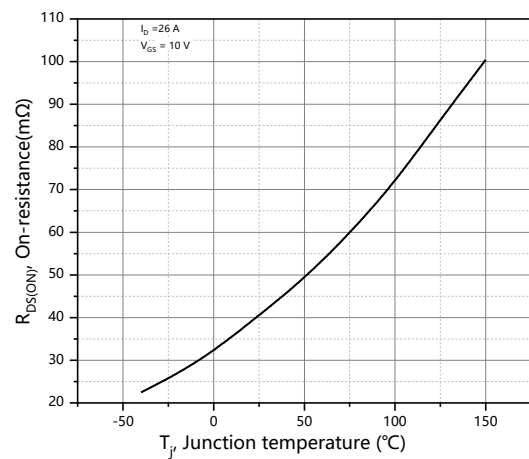
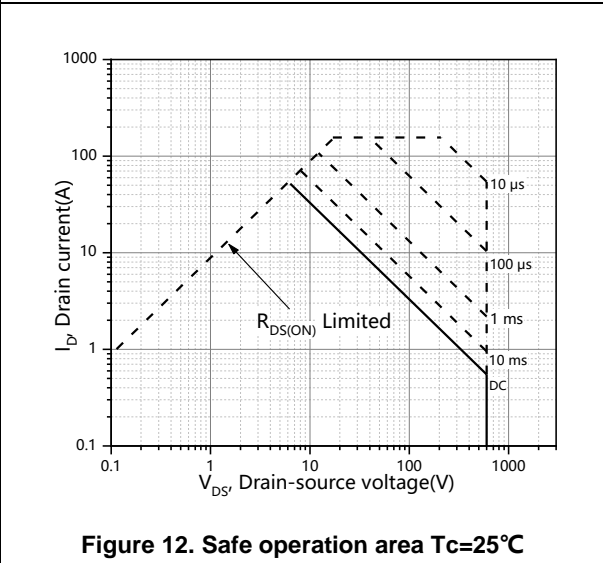
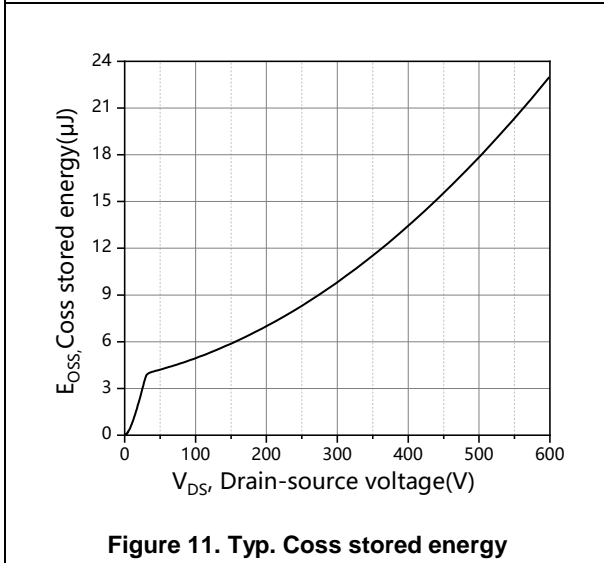
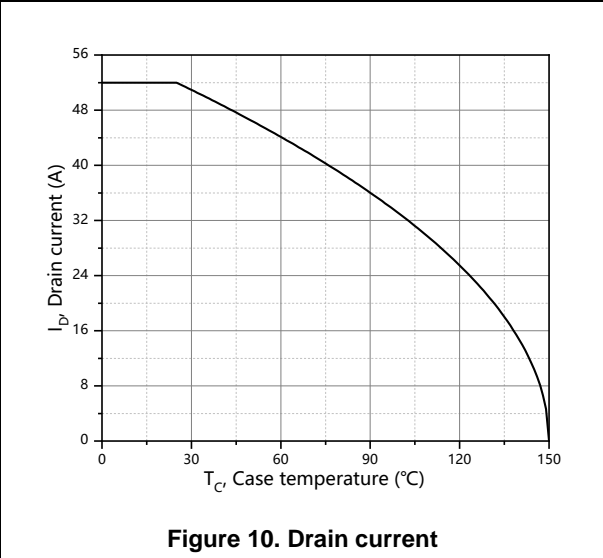
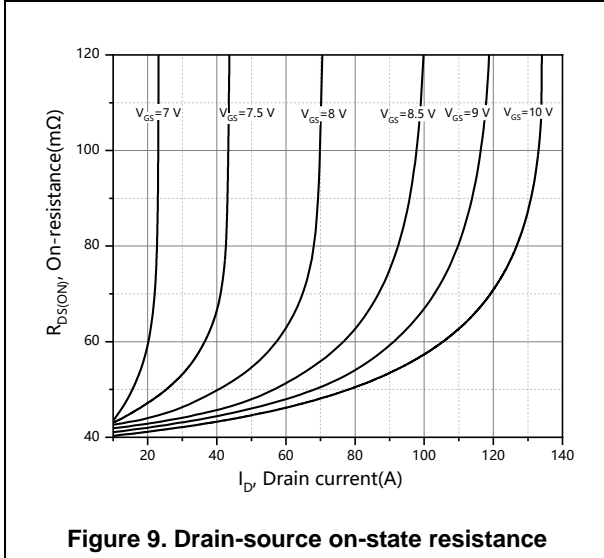
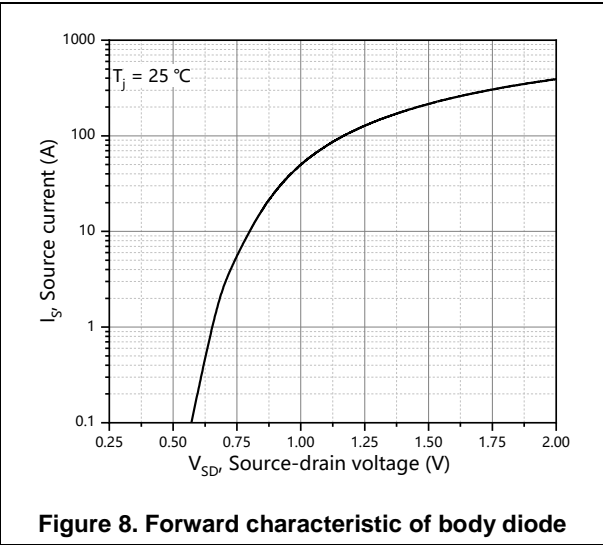
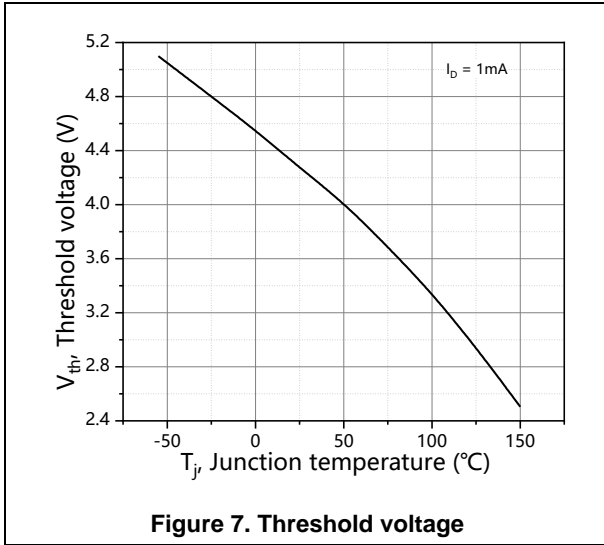
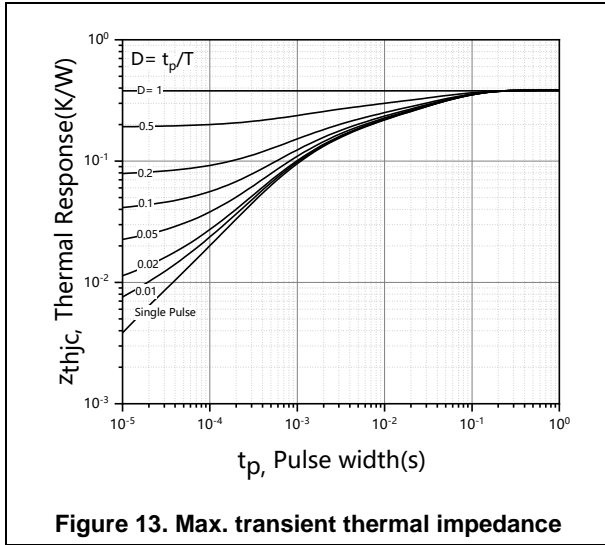


Figure 6. Drain-source on-state resistance





Test circuits and waveforms

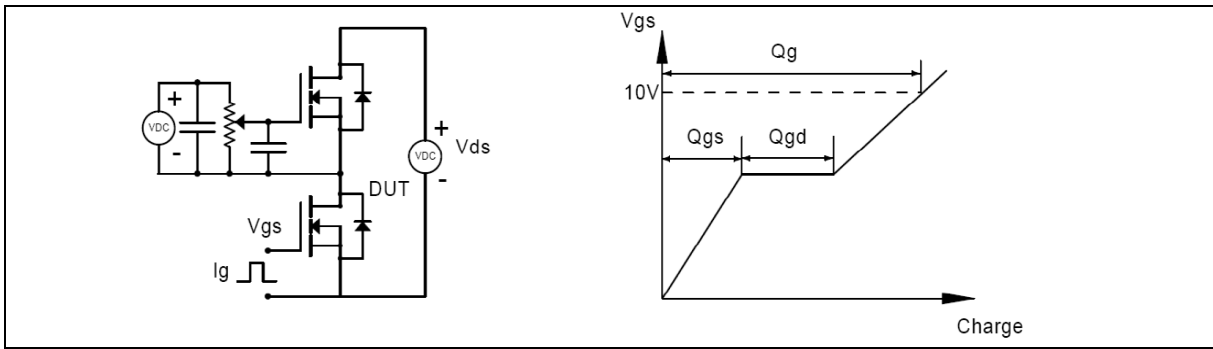


Figure 1. Gate charge test circuit & waveform

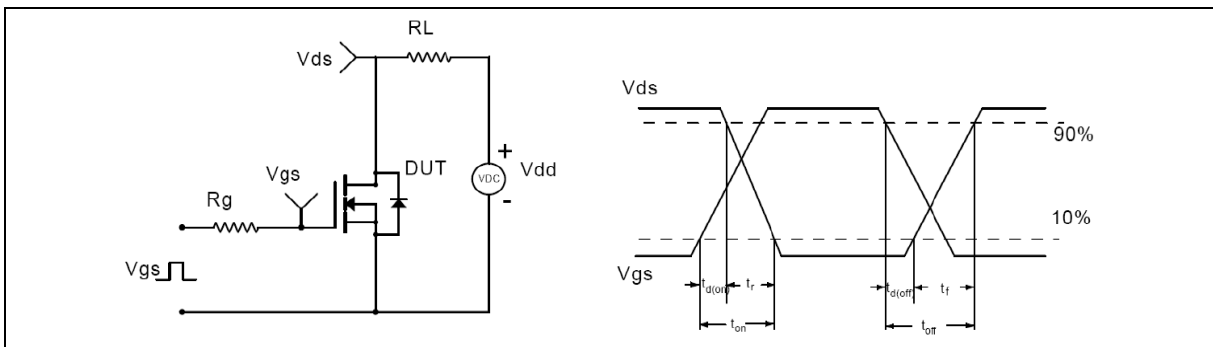


Figure 2. Switching time test circuit & waveforms

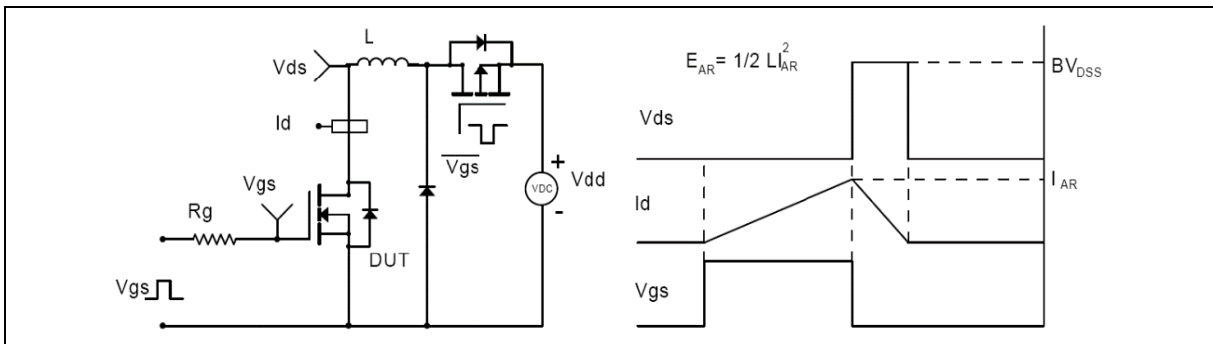


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

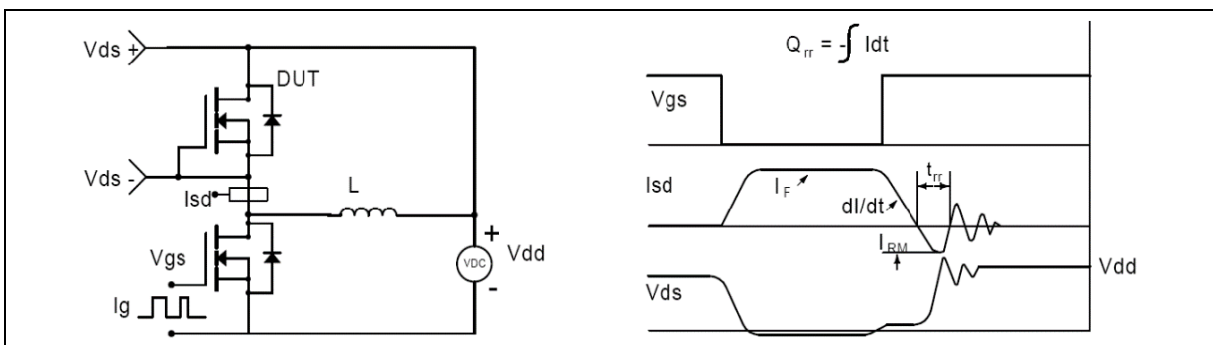
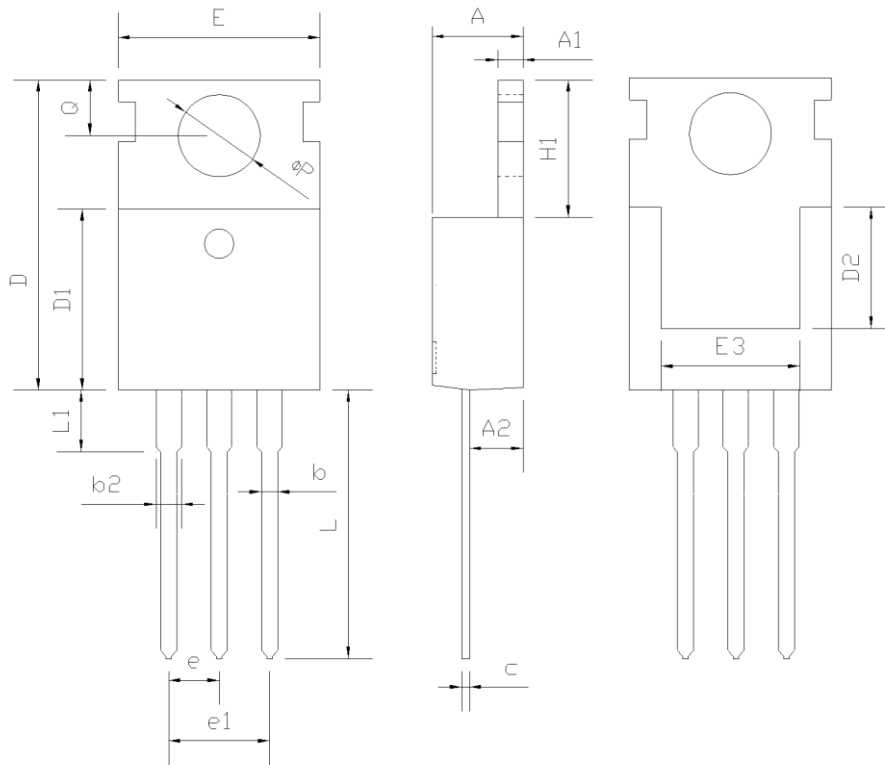


Figure 4. Diode reverse recovery test circuit & waveforms

Package Information



Symbol	mm		
	Min	Nom	Max
A	4.37	4.57	4.77
A1	1.25	1.30	1.45
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.40	0.50	0.65
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	-	-
E	9.70	10.00	10.30
E3	7.00	-	-
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
ΦP	3.40	3.60	3.80
Q	2.60	2.80	3.00

Version: TO220-P package outline dimension

Ordering Information

Package Type	Units/ Tube	Tubes/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO220-P	50	20	1000	6	6000

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG60R045PT4EZF	TO220	yes	yes	yes

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